1969 ANNUAL REPORT

Plant Protection Division

U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE

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July 1970

1969 ANNUAL REPORT, PLANT PROTECTION DIVISION

INTRODUCTION

Plant Protection Division (PPD) became the new name for Plant Pest Control on October 15, 1969. The Department also approved the reorganization of the Division on that date.

The change in the Division's name is significant because it more properly describes the Division's overall responsibilities. The new name emphasizes the positive aspects of protecting American agriculture from plant pests rather than controlling and eradicating them after infestation and destruction have occurred. The new name will be more meaningful to the public and to cooperators in the States, industry, and foreign governments.

The reorganization aims to achieve the following:

1. Further decentralization of responsibility for program operations and for day-to-day decisionmaking to the State and district levels.

2. Improvement of program planning and provision for control at Division level.

3. More effective direction and coordination in regards to methods development activities.

4. Increased attention to environmental quality related to pesticide use.

The pesticide controversy had a strong impact on Division activities during the year. On July 9, 1969, the Department established a 30-day suspension on the use of nine persistent pesticides on the cooperative control and eradication programs. During the period of the suspension, the Division was asked to review all recommended uses, to make changes wherever alternate chemicals were available to accomplish the objective, and to defend the minimum requirements for chlorinated hydrocarbons. Even though the suspension in general was lifted, the use of persistent pesticides remained under close scrutiny during the rest of the year. Despite the difficulties caused by the rapidly changing pesticide situation, much progress was made on cooperative plant protection programs. Highlights of accomplishments during the year are described on the following pages.

Army Cutworm

This western pest caused heavy damage to valuable crested wheatgrass reseeded areas of the Bureau of Land Management lands in Owyhee County, Idaho, in the spring of 1969. Larval populations, ranging from 36 to 77 per square yard, denuded 8,000 acres of new reseeding and threatened an additional 4,600 acres of 2-year-old seeding. The latter acreage was treated with aldrin in rolled

wheat bait applied by aircraft at the rate of 0.2 ounces per acre. Another 30,000 acres were moderately infested, but treatment was not feasible since the larvae were close to pupation. This area poses a potential threat in 1970. Since the larvae spend the day below the surface of the ground and feed above ground only at night, detection is difficult. Investigations on effective survey methods for the pest are needed. Early detection of infestations will allow for more effective control.

Barberry Eradication

The program to eradicate susceptible species of barberry throughout 19 Northern States continues to make good progress. There are now approximately 22,000 square miles which will need one or more inspections to assure eradication. The more active programs are in Illinois, Iowa, Kansas, Michigan, Missouri, Ohio, Pennsylvania, Virginia, and Washington.

During calendar year 1969, nearly four million rust-susceptible barberry bushes were destroyed. Of these, 549,971 were destroyed in December. Grain crop losses fluctuate from year to year, depending on weather conditions. The trend has continued to drop in recent years.

Boll Weevil

A trap baited with live boll weevils was used extensively during the year in survey and detection. This device eliminated the need for ground trash surveys on the High Plains control program. It is much more efficient in detecting boll weevils in the early spring than previous survey methods.

The trap was also used as a population suppression method in the spring in part of the High Plains program area. Results of these trap trials indicated possibly an 80-percent reduction in overwintered boll weevils. Aldicarb (Temik) treated trap plots were planted in the trapped area in conjunction with the trapping trials. However, these were not successful because of the difficulty in establishment of cotton in the trap plots ahead of the regular season's crop. The Entomology Research Division's trials in the area indicated areawide treatments with Temik were highly effective in reducing overwintering boll weevil populations. Plans for 1970 include a limited area in which pheromone traps and areawide Temik treatment of the cotton will be employed.

The sequence of treatments during the 1969 diapause treatment program was interrupted because of a shortage of funds and the spreading of an infestation into a new area to the southwest of the control zone. This resulted in only two early treatments being made to portions of the acreage in the original control zone. As a result, weevil populations during the latter part of the fall were essentially the same in treated and untreated fields where the program had been interrupted. Even with these problems, however, assessment of the overwintering population indicated an average of about 600 weevils per acre. This compares with about 2,300 weevils per acre in the fall of 1968 and is about equal to the numbers found in the fall of 1967.

In the 1969 calendar year, 769,230 aggregate acres were treated in the High Plains; 1,120 aggregate acres were treated in the Big Bend area of Texas and Mexico. Malathion and Guthion were the chemicals used.

Burrowing Nematode

The only known burrowing nematode infestations in U.S. citrus are in the State of Florida. During the 1969 calendar year, 135,663 root samples were processed at the Winter Haven laboratory. The initial inspection of 242 groves revealed 70 infested groves comprising 595 acres. Delimiting surveys were conducted on 3,319 acres in citrus groves. Burrowing nematodes were found in roots of 121 trees during inspection of 6,546 trees in margins of pushed areas. The State of Florida treated and pushed 6,546 infested trees. A total of 636 acres was treated with the fumigant DD at the rate of 60 gallons per acre. Barriers were established on 76,606 linear feet and maintained on approximately 2 million linear feet. The fumigant ethylene dibromide was used to fumigate the barriers. The initial application was at the rate of 50 gallons per acre and subsequent applications were made at 6-month intervals at the rate of 25 gallons per acre. In the survey of 76 commercial citrus nurseries, no burrowing nematodes were found, and only one of the 26 ornamental nurseries inspected was found infested.

Caribbean Fruit Fly

This insect was first found in the United States at Key West, Fla., in 1930. In 1965, populations became heavy in the Miami area. Specimens have now been reported from 28 Florida counties. Heavy damage has been done to dooryard fruits such as guava, Surinam cherries, and peaches. Some damage to commercial citrus has also been reported. The Entomology Research Division has established a facility at Miami where scientists are working primarily on rearing techniques, lures, and insecticides. During 1968 and 1969, tests were run by ENT and PPD using LV malathion at several dose rates and LV malathion plus a protein hydrolysate attractant. These tests showed that malathion alone at only 1 ounce per acre applied at 5- to 7-day intervals reduced populations to very low levels.

Cereal Leaf Beetle

Detection surveys conducted in 1969 showed this pest in 143 counties for the first time. Maryland, New York, and Virginia were added to the list of infested States. The quarantine has been amended to include all of the new areas. Due to the rapid spread to the south and east, the regulations were liberalized to allow the movement of untreated products to all States in this area except Florida, Massachusetts, Rhode Island, and Vermont. Full quarantine protection is being afforded the important grain-growing areas of the United States. In 1969, a total of 57,920 acres was treated with LV malathion in Illinois at the rate of 3 fluid ounces per acre.

The foreign egg parasite, Anaphes flavipes, has been reared and released by the PPD facility at Niles, Mich., since 1967. In 1969, recoveries were made in 15 locations in seven counties in Indiana and Michigan. Parasites were found in 12 locations where no releases had been made, indicating the wasp is well established. It is expected that the parasite will be a valuable factor for population suppression. Investigations show that in excess of 90 percent of cereal leaf beetle adults overwinter in the edge of the field in straw stubble, hedgerows, or similar areas. Cultural practices, such as fall plowing, hold promise as a means of reducing populations.

Citrus Blackfly

Detection survey methods for the citrus blackfly were modified early in 1968. In the east Mexico chemical control zone, 54,000 trees were inspected within a seven-million tree population. During late 1968 and 1969, the new detection survey procedure in east Mexico led to the discovery of 28 isolated infestations. Delimiting these infestations resulted in finding 24,941 infested trees. To contain the pest, 308,456 trees were treated. No infestations were found in the United States, although the survey led to the discovery of the first infestations since 1966 in Matamoros, Tamaulipas. Infestations were also found in 1969 along the Rio Grande at Nuevo Laredo and Reynosa, Tamaulipas. These hazardous infestations were treated with 4.9 percent carbophenothion emulsion applied at the rate of 1 pound of toxicant per 100 gallons of water. Treatment was prompt due to the cooperation of the Mexico Department of Agriculture.

This survey system was expanded in 1969 to include west Mexico; Arizona and Texas are to be included in 1970.

European Chafer

Chafers were found in Providence County, R.I., June 19, 1969, for a new State record. Three positive finds involving 173 acres were made in Ohio within the previously infested area. Part of this acreage on agricultural and nonagricultural lands was treated with granular chlordane applied at the rate of 10 pounds per acre; other nonagricultural lands were treated with granular dieldrin at the rate of 3 pounds per acre. New county records included Middlesex, Conn.; Hampden, Mass.; and Fulton, N.Y. A total of 37,612 acres was found infested outside the regulated area. Eradication treatments are planned for the Rhode Island infestation. Studies are underway to improve survey and to find alternate control methods. The effect of releasing sterilized male beetles is being studied in Pennsylvania. Cornell University found that the chafer was resistant to some of the chlorinated hydrocarbons in the East Rochester, N.Y., area but resistance was not widespread.

Giant African Snail

An outbreak of giant African snail (Achatina fulica) was confirmed in Miami, Fla., on September 15, 1969. These snails are general feeders and are capable of causing severe damage. Although the pest is found in Hawaii, this is the only established infestation known on the U.S. mainland.

Cornmeal bait containing 1.1 pounds of metaldehyde and 1.5 pounds of calcium arsenate per acre was the chosen control measure for this pest. Beginning October 1, 1969, the bait, applied at 35 pounds per acre, was broadcast at weekly intervals for 7 weeks, then at 2-week intervals. Ten applications were made in 1969. The infestation was confined to small areas of residential lawns in North Miami and Hollywood, Fla. (fig. 1). By applying eradication measures as soon as the snail was found, damage and further spread have been minimized. The infested areas are under Florida regulations.

Figure 1.--Giant African snail on lawn in Miami, Fla.

Golden Nematode

Detection surveys in Delaware in February 1969 revealed an infestation of golden nematode in New Castle County. This was the first infestation found in the United States outside New York State. As a result, a Federal golden nematode quarantine was invoked effective July 31, 1969. Regulations were applied only to the infested portions of New York and Delaware.

Land fumigated during the year consisted of 371 aggregate acres in Delaware and 754 acres in New York. The soil fumigant DD was used at the rate of 90 gallons per acre. Two applications of 45 gallons each were made, spaced 10 days apart. A total of 85,554 soil samples was taken from potato-growing areas in the United States.

Plans were underway at the end of 1969 to remove the State of Delaware from the Federal golden nematode quarantine. This action was taken after intensive, biometrically designed surveys conducted in the treated area failed to find any golden nematode cysts.

A mechanical soil sampling machine (fig. 2) has been developed which greatly reduces the hand labor required by the earlier methods and simultaneously increases the speed of survey operations. This machine takes a large number of very small soil samples at closely spaced intervals. Samples so taken give a

better representation of the field than was formerly obtained. Two or more units may be attached to a tractor to permit different intensities of sampling.

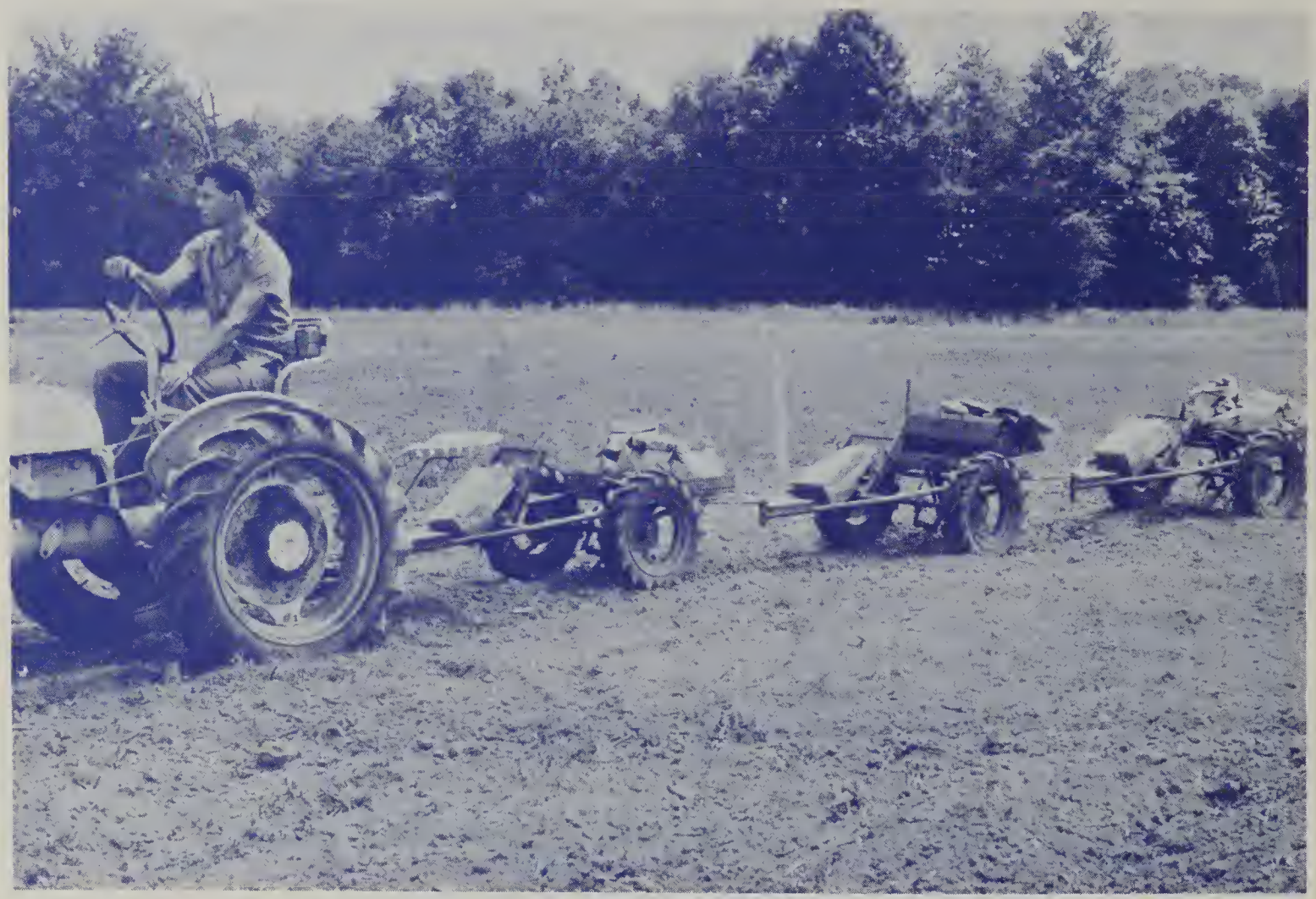

Figure 2.--Cyst nematode soil sampling machines at work in Delaware.

Grasshopper and Mormon Cricket

Grasshopper populations have increased slightly in some areas, but populations in the West and Midwest generally have continued at low levels. In calendar year 1969, rainfall kept the rangelands in good condition, and control treatments were needed on 402,424 acres. Good control was obtained with malathion applied at the rate of 8 fluid ounces per acre. All applications were made by aircraft.

Mormon cricket infestations remain at a record low level. In 1969, aircraft were used to treat about 750 acres in Nevada. Aldrin in rolled wheat bait was applied at the rate of 0.1 to 0.2 ounces of toxicant per acre. A few isolated spots were treated with ground equipment. Total acreage treated for Mormon cricket for the year was 1,215.

Gypsy Moth

Detection surveys in 1969 revealed the presence of the gypsy moth for the first time in Delaware, Maryland, and Virginia. Trailers and other types of camping equipment have been found to be a highly efficient means of spreading the pest. Parks and campgrounds have become priority areas for survey and regulatory

activities. To prevent spread, selected peripheral infestations in New Jersey, New York, and Pennsylvania were sprayed by aircraft. Carbaryl or LV Dylox were applied at the rate of 1 pound per acre to 53,728 acres.

Expansion of the gypsy moth rearing facility at Otis Air Force Base, Mass., was completed during the year. The facility now has the potential for producing 600,000 insects per season. Pupal collections were unusually successful in 1969 with one million pupae gathered. Most of the pupae were collected in Spain under the supervision of PPD. These collections have provided sex attractant for the trapping effort and will also be used in the research effort to isolate and identify the chemical structure of the pheromone.

The demands of an adequate gypsy moth research program exceed the capacity of the Federal agencies now involved. To correct this situation, the National Gypsy Moth Advisory Council, with representatives from concerned State and Federal agencies, universities, and industry, has been organized and is now in its first stages of development. The committee while acting as the coordinating body for the entire research program will seek to involve the State universities, industry, and others in the research effort.

During 1969, a total of 23,957,000 gypsy moth parasites was released in Pennsylvania, New York, New Jersey, Delaware, and Maryland. The majority of these were Ooencyrtus kuwanae, an egg parasite reared at the Hicksville, N.Y., laboratory (fig. 3). Other parasite colonies maintained at the Otis laboratory include Apanteles porthetriae, Rogas sp., Exorista rossica, and E. segregata.

Figure 3.--Gypsy moth egg parasite rearing facility.

During the 1969 calendar year, 13,415,737 acres were treated with 0.3 percent mirex bait at the rate of 1.25 pounds per acre for imported fire ant control.

Progress is being made on the improvement of mirex dispersing equipment on contract aircraft. Most of the contractors are equipping their planes with internal wing dispersing equipment. Use of this equipment increases the overall swath but does not increase dispersion of the chemicals in the environment.

Treatments have been completed in three research eradication blocks in Florida, Georgia, and Mississippi. The Georgia research blocks showed 100 percent control on all mature ant mounds. Control of mature mounds in the two blocks in Florida was 99.7 percent and 99.5 percent after the third application. On the two northeast Mississippi eradication blocks, 99.85 and 99.15 percent control was obtained after the second application. Readings have not yet been made after the third application completed in November 1969.

Work is continuing on further development of microencapsulated bait (fig. 4) and latex-coated mirex bait. It appears that both of these formulations may play important roles in future imported fire ant treatments. Considerable progress has been made on gaining more information on the biology of the imported fire ant. This information will be extremely helpful in timing treatments according to the geographical location of the infested area.

Figure 4.--Imported fire ant feeding on encapsulated bait.

Japanese Beetle

Sixteen additional counties were found infested during 1969 in the States previously known to be infested. Eradication treatments are being applied to isolated areas of infestation where possible. Part of the acreage on agricultural and nonagricultural lands was treated with granular chlordane applied at the rate of 10 pounds per acre; other nonagricultural lands were treated with granular dieldrin applied at the rate of 2 or 3 pounds per acre. New infestations, found during the survey season outside of the regulated area, amounted to 564,960 acres. Eradication of outlying infestations is becoming increasingly difficult with the limitation placed on the use of chlorinated hydrocarbons. Research continues to seek alternate methods of control. The outlook is not promising at this time, however. A systematic detection program designed to cover an entire metropolitan and rural area is being conducted annually in Illinois, Iowa, Michigan, and Missouri with some success. Over 29,000 traps have been set in noninfested areas.

Khapra Beetle

Khapra beetle was last found in the United States in March 1966. Since then, surveys have failed to reveal any additional infestations. One larva found in December 1969 in a trogotrap in a San Diego dock warehouse was not considered as representing an established infestation. Detection surveys and emergency treatment of cargo from infested ships will continue in the United States and Mexico.

Mediterranean Fruit Fly

No Mediterranean fruit flies were trapped in 1969 in the United States and Mexico. Surveys are carried out each year to promptly detect an introduction of this serious pest. The trapping program is concentrated in Florida, but traps are also operated in Arizona, California, Louisiana, and Texas. Through cooperative efforts with the Mexican Government, traps are operated in that country. Most of the traps are placed along the Mexico-Guatemala border to detect any introduction that may come in from infested Central American countries. Over 37,000 traps were operated during the year; 27,477 with multipurpose lures and 9,830 with single lures. Multipurpose lures are used for detection of such other important foreign fruit flies as the oriental fruit fly and the melon fly.

Mexican Fruit Fly

For the fifth year, the sterile male release technique has been successful in eradicating seasonal infestations of the Mexican fruit fly in northern Baja California, Mexico. The flies were reared and sterilized at the PPD facility at Monterrey. Over 22 million sterile flies were liberated during 1969 in Tijuana, Ensenada, and Tecate. Although 12 native adults were trapped around the sterile release sites, no native flies were trapped on the California-Arizona side of the Mexican border, indicating continued protection to the fruit crops of these two States. Approximately 8,400 traps were operated in this area and in Florida, Louisiana, and Texas. Forty-eight native adults were trapped in South Texas. Nine larval infestations were confirmed in this same area.

Sterile releases were initiated in October 1968 to eradicate a light endemic population of this fruit fly on about 7,000 acres around La Paz, Baja California. In 1969, about 23 million sterile flies were released in this isolated area pilot test. No native flies were trapped in 1969, indicating possible eradication. The releases were terminated August 20, 1969.

Oriental Fruit Fly

Specimens of this serious pest were trapped in both California and Florida in 1969. A total of 18 flies was trapped at 16 locations in El Monte, Los Angeles County, Calif., from September 11 to October 1. A single male fly was taken in Golden Beach, Dade County, Fla. An intensive trapping pattern was deployed around these finds.

Additional eradication measures taken in California involved a bait consisting of gelled methyl eugenol (the attractant) containing a small amount of naled (fig. 5). Small amounts of the bait were distributed as large drops on tree branches or trunks. Prompt, cooperative efforts eliminated an incipient infestation in the area. Fruit cutting failed to reveal any larvae.

Figure 5.--New gelled bait used against oriental fruit fly.

Peach Mosaic

This virus disease of peach and several of the Prunus species is known to occur in Arizona, Arkansas, California, Colorado, New Mexico, Oklahoma, Texas, and Utah.

It is spread by a microscopic mite or through budwood and nursery stock. Of the 1,917,427 trees examined in 1969, only 61 were found to be infected with peach mosaic. This is the lowest number of infected trees reported in any year for which we have a report. This program has been highly effective in maintaining the disease incidence (0.003 percent) at a noneconomic level and the prevention of spread through the movement of nursery stock. It offers a vital service to the grower and industry at extremely low Federal and State expenditures.

Phony Peach

Symptom surveys conducted on 4.2 million trees in seven Southern States revealed 10,753 infected peach trees. This is about the same number of trees inspected last year; however, the incidence of the disease rose from 0.13 percent to 0.25 percent this year.

Only technically trained inspectors are capable of identifying infected trees in the early stages. The longer the diseased trees remain in the orchard, the greater the chances of spread by insect vectors. Unless annual surveys are conducted and diseased trees removed, an infected orchard would rapidly become unprofitable. A major expense of the phony peach program is the removal of diseased trees, the cost of which is borne by the grower. Through this program, the Department and State cooperators are providing, at a very low cost, a service to the growers that they are not able to provide for themselves.

Pink Bollworm

In 1969, approximately 24 million sterile pink bollworm adults were distributed in the San Joaquin and Coachella Valleys. Five moths were caught in lure traps in the San Joaquin Valley during late September and early October. Extensive surveys in these areas did not reveal any larvae; however, one boll was found with exit holes, apparently caused by pink bollworm.

The program in the Coachella Valley was discontinued in early August when it became apparent that available sterile insects were not adequate to suppress the native population. Greater numbers of overwintering insects were present in this valley than were anticipated.

During the year, sterile drops were made in isolated fields in Arizona and Nevada. Preliminary results appear good in Arizona. Sterile releases were continued in the Florida Keys to suppress populations in wild cotton. The Phoenix, Ariz., rearing facility was developed during 1969 and will be in full production by the time program operations begin in 1970. The Brownsville, Tex., rearing facility will continue to supply sterile moths.

The synthetic lure, hexalure (fig. 6), was used in all survey and detection operations in 1969 with excellent results. The detection of the low level populations in the San Joaquin Valley in California indicates that this is an extremely efficient tool.

Figure 6.--Inspector servicing pink bollworm trap with hexalure.

Pistachio Seed Chalcid

The pistachio seed chalcid, Megastigmus pistaciae, was found in the USDA Plant Introduction Station at Chico, Calif., in September 1967. This pest, new to the Western Hemisphere, poses a serious threat to the new and expanding pistachio industry in California. During 1969, surveys were conducted at the Plant Introduction Station and in all of the 18 commercial pistachio-growing counties. Pistachio plantings at the station and along adjacent parkways, totaling 633 acres, received repeated applications of wettable methoxychlor at the rate of 1 pound per 100 gallons of water applied on trees until runoff. Cultural control practices of clean harvesting, pruning trees of stick-tight nuts, destroying volunteer seedlings, and deep-disking fallen nuts supplemented the chemical controls. An X-ray machine is being used to examine seeds for presence of larval stages of the insect.

In July 1969, specimens were collected for the first time outside of the station. Increased survey efforts revealed four infestations in Orange County and four infestations in San Diego County, all within seeds of ornamental

pistachio, Pistacia chinensis. The presence of this ornamental throughout California may lead to the Statewide establishment of this pest.

Range Caterpillar

Periodical outbreaks of the range caterpillar have occurred in New Mexico since 1895. In addition to destroying the primary host plant, grama grass, the larvae shed urticaceous hairs. Livestock will refuse to eat infested forage. Heavily spotted populations were found in Colfax County in 1969, but no cooperative control measures were undertaken.

The effectiveness of various nonpersistent insecticides, as possible substitutes for toxaphene, against the early and late larval stages, were evaluated this year. Several compounds were found to be effective, although they are more costly than toxaphene. Methods Development Branch, PPD, has determined that control measures should be undertaken, if possible, prior to July 15 of any buildup year. Population levels may be estimated by egg surveys made in early spring, supplemented by larval surveys in June.

Soybean Cyst Nematode

The most effective controls for the soybean cyst nematode are the use of resistant varieties and crop rotation. During the 1969 crop year, approximately 850,000 acres were planted to resistant varieties. Of considerable interest is the recent discovery that the existing resistant varieties are not resistant to all soybean cyst nematode races. Research workers are seeking parent stock that will provide resistance to the apparent new races.

Soybean seed can be a prime carrier of the nematode through soil peds (pellets) left with the seed after ordinary cleaning. Seed inspection for certification has become increasingly difficult and important as the volume of seed beans increases in the nematode-infested area. The spiral cleaner is removing a much larger percentage of the peds. Adhesion of soil to used farm machinery and construction equipment is also responsible for spreading the soybean cyst nematode. Stringent regulatory measures on the movement of such equipment to States outside the regulated areas should prevent spread by this means.

Surveys were carried out in all soybean-producing States. No new States were found infested; however, infestations were found in 17 new counties in eight of the 11 infested States.

Sweetpotato Weevil

Studies of the use of sex pheromone traps are continuing at Louisiana State University. Some problems are developing, however. Virgin females are attractive for only about 5 days, sterilization techniques are not perfected, and State officials and farmers are reluctant to allow live beetles in traps to be placed in sweetpotato plantings. New methods of control are needed because additional restrictions may be placed on the use of chlorinated hydrocarbon insecticides.

Sweetpotato weevil was first found in a warehouse in North Carolina in 1967 in the Tabor City area. In March 1969, the crates in which infested sweetpotatoes were found and warehouse cleaning and grading equipment were fumigated. The fumigant was methyl bromide applied at the rate of 1 pound per 1,000 cubic feet.

West Indian Sugarcane Root Borer

A heavy outbreak of the West Indian sugarcane root borer, Diaprepes abbreviatus, was found at Apopka, Fla., in September 1968, and at Plymouth, Fla., in 1969. The infestation involves approximately 1,087 acres of citrus groves with both the larval and adult forms causing damage. The regulated area involved 7,400 acres of which 2,844 acres are in citrus. In 1968, the Florida Department of Agriculture applied surface insecticide treatments of granular heptachlor at the rate of 3 pounds per acre to 5,141. In 1969, PPD treated an additional 556 acres, involving residential property around Apopka. The Division also applied foliage treatments to 7,723 aggregate acres in the vicinity of Apopka and Plymouth. During 1969, randomized detection survey was conducted for the adult weevils in the citrus area within a 25-mile radius outside the regulated area. Spot surveys were made on favorable host sites in both north and south Florida. All survey outside the known infested area was negative. The current program is one of containment with an ultimate objective of eradication.

Wheatgrass Bugs

During 1969, it was necessary to conduct control operations in two States against wheatgrass bugs (Labops). In Washington, 2,592 acres were treated with LV malathion at the rate of 8 fluid ounces per acre in the Yakima Indian Reservation, while in New Mexico, 4,000 acres were treated in the Santa Fe National Forest. These treatments saved valuable reseeded crested wheatgrass grazing land from severe damage. Surveys revealed moderate damage to 800 acres in Oregon and 35,000 acres of Indian land in northwest Arizona.

White-Fringed Beetles

In calendar year 1969, 12 counties were found infested for the first time in States previously known to be infested. Infestations were found in northern Virginia extending from Fort Belvoir into southern Alexandria. Eradication of outlying infestations is still an objective, but it is becoming increasingly difficult because of the limitation placed on the use of chlorinated hydrocarbon insecticides. Eradication is the objective in four States--Kentucky, Maryland, Missouri, and Texas. No beetle recoveries were made in Maryland or Kentucky during the year. Eradication treatments were applied to isolated infestations in other States. On nonagricultural lands, 10 percent dieldrin granules were used at the rate of 3 pounds actual per acre. On cultivated land, preplant 25-percent chlordane granules were used at the rate of 5 pounds actual per acre.

Limitations on the use of hydrocarbons are also affecting the regulatory program. In some instances, repeat foliar sprays of malathion or carbaryl are required. Both of these materials were applied at the rate of 1 pound per acre. Studies are being continued to find suitable substitutes for the chlorinated hydrocarbons for control treatments. The resistance of the species

Graphognathus peregrinus to chlorinated hydrocarbons has presented a very difficult problem in the Mobile, Ala., area. Farmers continue to use insecticide-fertilizers as a means of protecting their crops from damage by white-fringed beetles and other soil-inhabiting pests. An advisory committee, formed by Southern Plant Board and the Division, made an appraisal of the white-fringed beetle program. A final report of this study is being prepared.

Witchweed

Only one new county was found infested with witchweed in 1969, the first since 1965. The pest has been recorded now in 25 North Carolina counties and 11 South Carolina counties. About 356,000 acres are infested. In 1969, treatments of 2,4-D were applied to 466,395 aggregate acres at the rate of 1 pound per acre.

Fumigation with methyl bromide at the rate of 15 pounds per 1,000 square feet was continued in peripheral counties where very limited acreage is known to be infested. This year, 36 acres in North Carolina and 25 acres in South Carolina received the treatment. The experimental chemical Paraquat was used at the rate of 0.50 pound per acre in late July on several 10-acre blocks on noncultivated land and land planted to corn. This is a desiccant which destroys crabgrass and other weeds which serve as a host late in the season.

Insect Survey and Detection

During 1969, 10 insects new to the United States were reported. Of these, six were new to the Western Hemisphere--four in Hawaii and two in California. European clover leaf tier and fig psyllid, the two species reported from California, have some potential as economic pests. Giant African snail was found in Florida, the first record of an established infestation of this serious agricultural pest in continental United States. This snail is known to occur in Hawaii and other areas of the Pacific. In addition to the new U.S. records, there were 130 new State records reported during the year.

Cooperative survey agreements, providing for financial support of survey entomologists, continued in effect in 25 States. There are modified agreements with nine additional States. Approximately 640 cooperators submitted a total of 1,760 reports on insect conditions for the weekly "Cooperative Economic Insect Report." A revised and expanded publication on survey methods for economic insects was issued during the year.

Environmental Quality Monitoring Program

A cooperative fact-finding survey, conducted in the spring of 1969 in the Lake Michigan watershed, revealed that some pesticide formulating plants were disposing of part or all of their liquid wastes in city sewage systems. Followup investigations by State agencies with enforcement authority showed that some of these practices were not contributing significantly to pollution of the aquatic environment. Changes in disposal practices at some plants were brought about by the appraisal, however. Analyses of over 700 soil samples from the Lake Michigan watershed have been completed. This information is expected to show the extent to which residues in the soil might contribute to DDT and dieldrin levels in Lake Michigan.

In the regular monitoring program, soil was sampled at more than 1,500 cropland sites in 35 States. On about one-third of these sites, paired crop samples were taken for analysis including corn, sorghum, cotton, soybeans, and hay.

Four hundred soil samples were collected from eight cities in the fall of 1969. This pilot study will aid in a determination of the future monitoring needs in urban areas.

Special studies included sampling of paired crop and soil samples of wheat, onions, and sweetpotatoes. The vertical migration of the herbicide picloram in the soil was also undertaken as a special study.

Data from the intensive study areas sampled during 1965, 1966, and 1967, have been published in ARS 81-32, "Monitoring Agricultural Pesticide Residues 1965-1967, A Final Report on Soil, Crops, Water, Sediment, and Wildlife in Six Study Areas." Some of the most significant aspects of this study are as follows: Most of the hay samples contained pesticide residues. Levels of some of the more persistent pesticides such as DDT, dieldrin, and endrin in soil did not decrease markedly during the 3-year study period. Relatively high residues of DDT (up to 44 p.p.m.) were found in some species of fish from farm ponds which received drainage from the study areas. Nearly all of the wildlife samples contained measurable amounts of DDT and/or one of its isomers; the highest levels of these chemicals were found in bird eggs and fish, whereas the lowest levels were found in small mammals. Dieldrin was found in about half of the organisms sampled in amounts generally below 0.5 p.p.m. There was no evidence that pesticide residues have built up progressively over a period of time in the soils of these areas.

TABLE 1.--BARBERRY ERADICATION--CALENDAR YEAR 1969

STATE	SURVEY	CONTROL		REGULATORY
	AREA SURVEYED	PLANTS DESTROYED	AREA PLACED ON MAINTENANCE	NURSERY INSPECTIONS
	SQUARE MILES	NUMBER	SQUARE MILES	NUMBER
ALABAMA				33
ARIZONA				29
ARKANSAS				2
CALIFORNIA				70
COLORADO	67	22,187	11	19
CONNECTICUT				42
DELAWARE				8
FLORIDA				26
GEORGIA				27
ILLINOIS	69	237	27	37
INDIANA	31	30	24	6
IOWA	329	546	628	9
KANSAS	750	116	738	21
KENTUCKY				16
LOUISIANA				27
MAINE				3
MARYLAND				39
MASSACHUSETTS				20
MICHIGAN	184	1,036	96	22
MINNESOTA	81	318	3	30
MISSISSIPPI				10
MISSOURI	16	2	40	16
MONTANA	1			
NEBRASKA	35	6	29	3
NEW JERSEY				76
NEW YORK				45
NORTH CAROLINA				7
NORTH DAKOTA	1		1	
OHIO	133	400	32	120
OKLAHOMA				17
OREGON				53
PENNSYLVANIA	618	5,358	53	51
RHODE ISLAND				41
SOUTH CAROLINA				2
SOUTH DAKOTA	6	4	5	2
TENNESSEE				68
TEXAS		17		8
UTAH				5
VIRGINIA	27	879,321		148
WASHINGTON	205	483	132	18
WEST VIRGINIA	29	2,485,539	1	18
WISCONSIN	79	387	35	5
TOTAL	2,661	3,395,987	1,855	1,199

TABLE 2.--BOLL WEEVIL--CALENDAR YEAR 1969

UNITED STATES AND MEXICO	SURVEY AND DETECTION AREA VISUALLY SURVEYED	CONTROL AREA TREATED
	ACRES	ACRES 1/
UNITED STATES:		
ARIZONA	220	
MISSISSIPPI	1,407	
NEW MEXICO	770	
TEXAS	769,902	769,230
MEXICO	6,364	1,120
TOTAL	778,663	770,350

1/ Aggregate acres.

TABLE 3.--CEREAL LEAF BEETLE--CALENDAR YEAR 1969

STATE	SURVEY AND DETECTION AREA SURVEYED	CONTROL AREA TREATED
	ACRES	ACRES
ALABAMA	65	
CONNECTICUT	81	
DISTRICT OF COLUMBIA	10	
ILLINOIS	143,828	57,920
INDIANA	5,670	
IOWA	1,645	
LOUISIANA	146	
MARYLAND	2,620	
MASSACHUSETTS	140	
MISSOURI	4,860	
NEW JERSEY	2,163	
NEW YORK	3,410	
NORTH CAROLINA	115	
PENNSYLVANIA	14,461	
RHODE ISLAND	28	
TENNESSEE	37,555	
TEXAS	12,534	
VIRGINIA	5,422	
WEST VIRGINIA	1,547	
WISCONSIN	12,758	
TOTAL	249,058	57,920

TABLE 4.--CITRUS BLACKFLY--CALENDAR YEAR 1969

UNITED STATES AND MEXICO	SURVEY AND DETECTION		CONTROL
	TREES EXAMINED	TREES INFESTED	HOST PLANTS TREATED
	NUMBER	NUMBER	NUMBER
UNITED STATES:			
ARIZONA	289		
TEXAS	23,100		
MEXICO	936,528	24,941	308,456
TOTAL	959,917	24,941	308,456

TABLE 5.--EUROPEAN CHAFER--CALENDAR YEAR 1969

STATE	SURVEY AND DETECTION	CONTROL	REGULATORY	
	SITES TRAPPED	AREA TREATED	AREA TREATED	NURSERY AND OTHER INSPECTIONS
	NUMBER	ACRES	ACRES	NUMBER
CONNECTICUT	346		16	17
DELAWARE	4			
INDIANA	25			
MAINE	91			
MARYLAND	72			7
MASSACHUSETTS	503	469	4	126
MICHIGAN	28			
NEW HAMPSHIRE	773			
NEW JERSEY	567	100		
NEW YORK	2,889		534	526
OHIO	1,231	173	500 1/	20
PENNSYLVANIA	842		8	76
RHODE ISLAND	304			
VERMONT	88			
VIRGINIA	24			24
TOTAL	7,787	742	1,062	796

1/ Foliage.

TABLE 6.--GOLDEN NEMATODE--CALENDAR YEAR 1969

STATE	SURVEY AND DETECTION		CONTROL	REGULATORY
	AREA SURVEYED	SAMPLES TAKEN	AREA FUMIGATED	POTATO GRADER STATION INSPECTIONS
	ACRES	NUMBER	ACRES	NUMBER
ALABAMA		94		
DELAWARE	10,524	17,475	371	2
FLORIDA	220	107		1
KENTUCKY		17		
MAINE	19,451	4,202		
MARYLAND	1,974	1,692		
MASSACHUSETTS	2,300	300		
MICHIGAN	2,630	263		
MISSISSIPPI		5		
NEW JERSEY	4,153	1,583		
NEW YORK	35,309	52,642	754	1,301
NORTH CAROLINA	310	388		
OHIO	6,130			
PENNSYLVANIA	5,194	1,229		
RHODE ISLAND	1,795	212		
VIRGINIA	4,098	5,345		
TOTAL	94,088	85,554	1,125	1,304

TABLE 7.--GRASSHOPPER CONTROL--CALENDAR YEAR 1969

STATE	SURVEY AND DETECTION AREA INFESTED 1/	CONTROL AREA TREATED
	ACRES	ACRES
ARIZONA	28,000	12,096
CALIFORNIA	356,090	8,857
COLORADO	18,000	
HAWAII		480
IDAHO	1,770,000	110,304
KANSAS	40,000	
MONTANA	369,000	35,072
NEBRASKA	20,000	
NEVADA	37,510	
NEW MEXICO	923,000	
OKLAHOMA	690,000	
OREGON	33,700	31,104
TEXAS	1,856,618	
UTAH	378,860	
WASHINGTON	160,000	
WYOMING	257,140	204,511
TOTAL	6,937,918	402,424

1/ Adult survey, 1969.

TABLE 8.--GYPSY MOTH--CALENDAR YEAR 1969

STATE	SURVEY AND DETECTION	CONTROL		REGULATORY	
	SITES TRAPPED	AREA TREATED CHEMICALLY	PARASITES RELEASED 1/	NURSERY AND OTHER INSPECTIONS	COMMODITY TREATMENTS
	NUMBER	ACRES	NUMBER	NUMBER	NUMBER
ALABAMA	50				
ARKANSAS	208			1	
CALIFORNIA	582				
COLORADO				1	
CONNECTICUT		321		2,311	110
DELAWARE	4,531		831	3	
FLORIDA				37	5
GEORGIA	82			6	
ILLINOIS	50			9	
INDIANA				5	
KANSAS				2	
KENTUCKY				16	
MAINE	150			1,399	493
MARYLAND	4,318	2	20	91	1
MASSACHUSETTS				679	20
MICHIGAN	1,241			6	
MINNESOTA	19				1
MISSOURI				2	
NEBRASKA				1	
NEW HAMPSHIRE	21			752	140
NEW JERSEY	6,167	27,105	8,318	1,495	328
NEW YORK	10,000	20,207	5,045	1,491	1,124
NORTH CAROLINA	54			26	4
OHIO				102	
PENNSYLVANIA	24,165	6,088	9,743	2,561	2
RHODE ISLAND				262	
SOUTH CAROLINA				4	1
TENNESSEE	200			2	
TEXAS	39	2		12	3
VERMONT	129			1,204	28
VIRGINIA	1,030	3		28	1
WEST VIRGINIA	3,102				
WISCONSIN	50			1	1
WYOMING				1	
TOTAL	56,188	53,728	23,957	12,510	2,262

1/ Per units of 1,000.

TABLE 9.--IMPORTED FIRE ANT--CALENDAR YEAR 1969

STATE	SURVEY AND DETECTION	CONTROL	REGULATORY			
	AREA SURVEYED	AREA TREATED	NURSERY INSPECTIONS	ALL OTHER INSPECTIONS	COMMODITY TREATMENTS	PESTICIDE TREATMENTS SOIL
	ACRES	ACRES 1/	NUMBER	NUMBER	NUMBER	ACRES
ALABAMA	1,112,584	302,748	1,966	4,767	1,464	5,469
ARIZONA				4		
ARKANSAS	678,969	123,301	3	6	3	3
CALIFORNIA	10					
FLORIDA	549,742	1,825,594	1,329	1,271	278	2,198
GEORGIA	6,170,323	7,382,712	866	758	911	1,863
ILLINOIS				1		
INDIANA					6	
LOUISIANA	3,660,028	1,642,483	954	437	60	1,197
MARYLAND	1			10		
MISSISSIPPI	606,258	917,691	551	985	2,056	653
NORTH CAROLINA	2,085,652	89,118	6	34	11	
OHIO				8		
OKLAHOMA	3,315					
PENNSYLVANIA					1	
SOUTH CAROLINA	677,272	982,871	39	100		34
TENNESSEE	956,483		10	12		
TEXAS	1,084,989	149,219	2,472	1,004	82	1,327
VIRGINIA	1,426		5	198	18	
TOTAL	17,587,052	13,415,757	8,201	9,595	4,890	12,744

1/ Aggregate acres.

TABLE 10.--JAPANESE BEETLE--CALENDAR YEAR 1969

STATE	SURVEY AND DETECTION			CONTROL	REGULATORY	
	AREA SURVEYED	SITES TRAPPED	AREA INFESTED OUTSIDE REGULATED AREA	AREA TREATED CHEMICALLY	AREA TREATED SOIL	COMMODITY TREATMENTS
	ACRES	NUMBER	ACRES	ACRES	ACRES	NUMBER
ALABAMA	4,098	3,059		145		2
ARKANSAS	40	239				
CALIFORNIA		4,926				
COLORADO		132				
CONNECTICUT					540	88
DELAWARE					1,600	22
DISTRICT OF COLUMBIA						121
FLORIDA		334				1
GEORGIA	195	1,817	499,000		195	2
HAWAII		20				
IDAHO		8				
ILLINOIS	140	11,131	57,960	32,388	3	1
INDIANA		4,904	5,680		299	6
IOWA	291	1,761				
KANSAS		166				
KENTUCKY	1,408	6,248	246	90	97	
LOUISIANA	24	158				
MAINE	4	99				15
MARYLAND	324				256	4,029
MASSACHUSETTS	459				8	77
MICHIGAN		27,823	1,320	2,216		5
MINNESOTA		1,821				
MISSISSIPPI		240				
MISSOURI		3,635				
NEBRASKA		86				
NEVADA		8				
NEW HAMPSHIRE						9
NEW JERSEY	298				264	163
NEW YORK					533	89
NORTH CAROLINA	45	10			386	1,136
NORTH DAKOTA		74				
OHIO	5,256	6,381	54	333	802	82
OKLAHOMA		130				
OREGON		292				
PENNSYLVANIA	93				14	111
RHODE ISLAND	70				92	4
SOUTH CAROLINA	380	1,017			141	159
SOUTH DAKOTA		453				
TENNESSEE	3,937	7,437	700			
TEXAS		159				
VERMONT	2					6
VIRGINIA	91				1,429	149
WASHINGTON		102				
WEST VIRGINIA					11	10
WISCONSIN		1,158				
TOTAL	17,155	85,828	564,960	35,172	6,670	6,287

TABLE 11.--KHAPRA BEETLE--CALENDAR YEAR 1969

UNITED STATES AND MEXICO	SURVEY AND DETECTION PROPERTIES SURVEYED NUMBER	REGULATORY COMMODITY TREATMENTS NUMBER
UNITED STATES:		
ALABAMA	4	3
ARIZONA	2,088	
ARKANSAS	3	
CALIFORNIA	2,446	
COLORADO	162	
DELAWARE	1	
FLORIDA		2
HAWAII	20	
ILLINOIS	59	
INDIANA		1
IOWA	3	
KANSAS		2
LOUISIANA	467	
MICHIGAN	21	
MINNESOTA		1
MISSISSIPPI	27	
MISSOURI	2	
NEW JERSEY	16	
NEW YORK	7	
NEW MEXICO	266	
NORTH CAROLINA	1	1
OHIO	3	10
OKLAHOMA	261	
PENNSYLVANIA	1	
SOUTH CAROLINA	3	
TENNESSEE	4	
TEXAS	269	5
VIRGINIA		2
WASHINGTON	209	
WEST VIRGINIA	3	
WYOMING	387	
MEXICO	2,115	447
TOTAL	8,848	474

TABLE 12.--MEDITERRANEAN FRUIT FLY--CALENDAR YEAR 1969

UNITED STATES AND MEXICO	SURVEY AND DETECTION
	TRAPS INSTALLED
	NUMBER
UNITED STATES:	
ARIZONA	104
FLORIDA	32,278
GEORGIA	25
LOUISIANA	34
NORTH CAROLINA	15
SOUTH CAROLINA	13
TEXAS	897
MEXICO	3,941
TOTAL	37,307

TABLE 13.--MEXICAN FRUIT FLY--CALENDAR YEAR 1969

UNITED STATES AND MEXICO	SURVEY AND DETECTION		CONTROL	REGULATORY
	TRAPS INSTALLED	AREA INFESTED	BIOLOGICAL STERILE FLIES RELEASED 1/	COMMODITY TREATMENTS
	NUMBER	ACRES	NUMBER	NUMBER
UNITED STATES:				
ARIZONA	134			1
CALIFORNIA	3,150		5	
FLORIDA	1,770			
LOUISIANA	8			
TEXAS	2,795	1,406		1,020
MEXICO	610		49,315	4,736
TOTAL	8,467	1,406	49,320	5,757

1/ Units of 1,000.

TABLE 14.--PEACH MOSAIC--CALENDAR YEAR 1969

STATE	SURVEY AND DETECTION	CONTROL	REGULATORY
	HOSTS EXAMINED	TREES REMOVED	NURSERY INSPECTIONS
	NUMBER	NUMBER	NUMBER
ARKANSAS	171,700		12
CALIFORNIA	151,137		
COLORADO	678,255	61	
MISSOURI	367,900		
OKLAHOMA	238,913		3
TEXAS	284,867	5	26
UTAH	24,655	4	
TOTAL	1,917,427	70	41

TABLE 15.--PHONY PEACH--CALENDAR YEAR 1969

STATE	SURVEY AND DETECTION		CONTROL		REGULATORY
	HOSTS EXAMINED	HOSTS POSITIVE	AREA TREATED	TREES REMOVED	NURSERY SITES APPROVED
	NUMBER	NUMBER	ACRES	NUMBER	NUMBER
ARKANSAS	191,675	11		11	14
GEORGIA	2,284,860	9,339	46	11,166	
LOUISIANA	92,377	209		37	
MISSISSIPPI	41,850	960	2	965	1
MISSOURI	30,200				
SOUTH CAROLINA	1,364,250	216	83	216	
TEXAS	178,513	18		18	6
TOTAL	4,183,725	10,753	131	12,413	21

TABLE 16.--PINK BOLLWORM--CALENDAR YEAR 1969

UNITED STATES AND MEXICO	SURVEY AND DETECTION		CONTROL	REGULATORY
	AREA SURVEYED	TRAPS INSTALLED	AREA TREATED MECHANICALLY	COMMODITY TREATMENTS
	ACRES	NUMBER	ACRES	NUMBER
UNITED STATES				
ALABAMA		349		
ARIZONA	5,979	90	284,800	81
ARKANSAS		691	983,099	84
CALIFORNIA	462,722	68,095	317,139	1,031
FLORIDA	3	451		
GEORGIA		140		4
KENTUCKY		25		
LOUISIANA		753	163,540	26
MINNESOTA				1
MISSISSIPPI		809		7
MISSOURI		400		
NEVADA	336	176	1,040	2
NEW MEXICO	2,410	250	96,110	9
OKLAHOMA				13
SOUTH CAROLINA		49		
TENNESSEE		504		
TEXAS	44,101	4	1,491,001	1,087
MEXICO	714,235	2,184	740,402	6,330
TOTAL	1,229,786	74,970	4,077,131	8,675

TABLE 17.--SOYBEAN CYST NEMATODE--CALENDAR YEAR 1969

STATE	SURVEY AND DETECTION			REGULATORY
	AREA SURVEYED	SAMPLES TAKEN	AREA INFESTED	COMMODITY TREATMENTS
	ACRES	NUMBER	ACRES	NUMBER
ALABAMA	47,982	32		2
ARKANSAS	32,910	3,597	2,278	186
DELAWARE		411		
FLORIDA	2,700	305	60	
ILLINOIS	31,390	6,156	2,007	12
INDIANA		800	1,775	
IOWA	47,178	41		
KENTUCKY	9,742	847	1,000	41
LOUISIANA	104,124	1,946	2,249	
MARYLAND	16	18		
MISSISSIPPI	157,807	2,228	50,080	66
MISSOURI	27,405	322		1,542
NORTH CAROLINA	135,415	3,331	15,072	1,139
OHIO	8,357			
OKLAHOMA	19,073			
TENNESSEE	16,269	773	3,014	24
TEXAS	8,280			
VIRGINIA		2,478	535	31
TOTAL	648,648	23,285	78,070	3,043

TABLE 18.--SWEETPOTATO WEEVIL--CALENDAR YEAR 1969

STATE	SURVEY AND DETECTION		CONTROL		REGULATORY
	BUSHELS SURVEYED	TREATED CHEMICALLY	TREATED CHEMICALLY	TREATED MECHANICALLY	COMMODITY TREATMENTS
	NUMBER	ACRES	BUSHELS	ACRES	NUMBER
ALABAMA	255,438	1,475	4,500	1,125	
GEORGIA	3,605	17		5	
LOUISIANA	693,537	66	2,203	12,898	
MISSISSIPPI	8,709				
NORTH CAROLINA	680,883				
SOUTH CAROLINA	80,093	76			
TEXAS	15,440	433			
VIRGINIA	2,812				
TOTAL	1,740,517	2,067	6,703	14,028	69

TABLE 19.--WHITE-FRINGED BEETLES--CALENDAR YEAR 1969

STATE	SURVEY AND DETECTION		CONTROL	REGULATORY		
	AREA SURVEYED	AREA INFESTED	AREA 1/ TREATED	COMMODITY TREATMENTS	AREA TREATED	
					SOIL	FOLIAGE
	ACRES	ACRES	ACRES	NUMBER	ACRES	ACRES
ALABAMA	281,422	47,989	26,773	1,500	10,483	12,192
ARKANSAS	15,165	400	726		11	12
DELAWARE	2					
DISTRICT OF COLUMBIA	468			132	7	
FLORIDA	2,275	60		135	948	100
GEORGIA	34,205	6,753	445	2,370	2,213	
ILLINOIS	10					
INDIANA				6		
KENTUCKY	3,567					
LOUISIANA	11,298	446,823	736	85	843	2,071
MARYLAND	4,759		29	4	10	
MISSISSIPPI	34,393	525	690	2,040	679	2
MISSOURI	8,872		571			
NEW JERSEY	501					
NORTH CAROLINA	39,818	16,919	577	625	354	
OHIO	70					
OKLAHOMA	1,130					
PENNSYLVANIA	138			1		
SOUTH CAROLINA	14,493	1,341	671		65	
TENNESSEE	93,486	131,932	4,287	16	503	775
TEXAS	4,623	10	67	6	2	
VIRGINIA	35,069	3,582	602	1,453	2,011	246
WEST VIRGINIA	81					
TOTAL	585,845	656,334	36,174	8,373	18,129	15,398

1/ Includes soil, surface, and foliage.

TABLE 20.--WITCHWEED--CALENDAR YEAR 1969

STATE	SURVEY AND DETECTION		CONTROL	REGULATORY
	AREA SURVEYED	AREA INFESTED	AREA TREATED	COMMODITY TREATMENTS
	ACRES	ACRES	ACRES 1/	NUMBER
ALABAMA	69,065			
ARKANSAS	3,357			
FLORIDA	80			
GEORGIA	229			
IOWA	8,432			
KENTUCKY	30			
LOUISIANA	9,803			
MARYLAND	1,807			
MINNESOTA	2,760			
MISSISSIPPI	11,166			
MISSOURI	3,185			
NEW JERSEY	138			
NORTH CAROLINA	250,312	6,621	372,170	5,345
OHIO	965			
OKLAHOMA	40,200			
PENNSYLVANIA	2,505			
SOUTH CAROLINA	119,472	1,974	94,225	2,540
TENNESSEE	6,824			
TEXAS	6,183			
VIRGINIA	7,743			1
WEST VIRGINIA	209			
TOTAL	544,465	8,595	466,395	7,886

1/ Aggregate acres.

This publication does not contain recommendations for the use of pesticides, nor does it imply that all uses discussed here have been registered. All uses of pesticides must be registered by appropriate State and/or Federal agencies before they can be recommended.

CAUTION: Pesticides can be injurious to humans, domestic animals, desirable plants, and fish and other wildlife -- if they are not handled or applied properly. Use all pesticides selectively and carefully. Follow recommended practices for the disposal of surplus pesticides and pesticide containers.

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